



DEPARTMENT OF ENERGY

National Nuclear Security Administration

Secretarial Determination of No Adverse Impact on the Domestic Uranium Mining, Conversion, and Enrichment Industries to Support Mo-99 Production

AGENCY: National Nuclear Security Administration (NNSA), Department of Energy (DOE).

ACTION: Notice.

SUMMARY: On November 24, 2021, the Secretary of Energy issued a determination (“Secretarial Determination”) covering the sale, lease, or transfer of up to 750 kilograms uranium (kgU) of high-assay low enriched uranium (HALEU) (above 5 but less than 20 wt. percent uranium-235) per calendar year to support the development and establishment of molybdenum-99 (Mo-99) production capabilities. For the reasons set forth in the Department's “Analysis of Potential Impacts of Certain Uranium Transactions on the Domestic Uranium Mining, Conversion, and Enrichment Industries,” which is incorporated into the Secretarial Determination, the Secretary determined that these transactions will not have an adverse material impact on the domestic uranium mining, conversion, or enrichment industry.

FOR FURTHER INFORMATION CONTACT: Requests for additional information may be sent to Brett Cox: officeofconversion@nnsa.doe.gov or (202) 287-5191.

SUPPLEMENTARY INFORMATION:

Authority and Background:

The Department of Energy (“the Department”) holds limited inventories of uranium in various forms and quantities that have been declared as excess and are not

dedicated to U.S. national security missions. Within DOE, the National Nuclear Security Administration (NNSA) manages these inventories. NNSA down-blends excess highly-enriched uranium (HEU) to high-assay low-enriched uranium (HALEU)— a subset of low enriched uranium (LEU), enriched above the commercial level of 5 wt-% and below 20 wt-% of the isotope U-235. Common applications of such high-assay materials are as fuels for domestic and foreign research reactors and as target materials for the production of medical isotopes.

This notice involves the sale, lease, or transfer of HALEU to support domestic molybdenum-99 (Mo-99) producers. These sales, leases, and transfers fulfill a directive in the American Medical Isotopes Production Act of 2012 (Pub. L. 112–239, Division C, Title XXXI, Subtitle F, 42 U.S.C. 2065) for the Department to establish a program to make HALEU available, through lease contracts, for the production of Mo-99 for medical uses. These sales, leases, and transfers also support U.S. nuclear nonproliferation initiatives, by down-blending HEU and encouraging the use of LEU in civilian applications in lieu of HEU.

These sales, leases or transfers are conducted in accordance with the Atomic Energy Act of 1954 (42 U.S.C. 2011 *et seq.*, “AEA”), as amended, and other applicable law. Specifically, Title I, Chapters 6 and 14 of the AEA authorize DOE to sell or transfer special nuclear material, including HALEU. The United States Enrichment Corporation (USEC) Privatization Act (Pub. L. 104-134, 42 U.S.C. 2297h *et seq.*) places certain limitations on DOE’s authority to sell or transfer uranium from its excess uranium inventory. Specifically, under section 3112(d) of the USEC Privatization Act (42 U.S.C. 2297h-10(d)), DOE may make certain sales or transfers of natural uranium or LEU if the Secretary determines that the sales or transfers “will not have an adverse material impact on the domestic uranium mining, conversion or enrichment industry, taking into account

the sales of uranium under the Russian Highly Enriched Uranium Agreement and the Suspension Agreement.”

On November 23, 2021, the Secretary of Energy issued a determination covering the sale, lease, or transfer of up to 750 kgU of HALEU per calendar year to support the development and establishment of Mo-99 production capabilities. For the reasons set forth in the Department's “Analysis of Potential Impacts of Certain Uranium Transactions on the Domestic Uranium Mining, Conversion, and Enrichment Industries,” which is incorporated into the Secretarial Determination, the Secretary determined that these transactions will not have an adverse material impact on the domestic uranium mining, conversion, or enrichment industry. In accordance with section 306(a) of Division D, Title III of the *Consolidated and Further Continuing Appropriations Act*, 2015 (Pub. L. 113-235)), this determination is valid for no more than two calendar years following the date of the Secretarial Determination.

Signing Authority

This document of the Department of Energy was signed on April 5, 2022, by Corey Hinderstein, Deputy Administrator for Defense Nuclear Nonproliferation, pursuant to delegated authority from the Secretary of Energy. The document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on April 6, 2022.

Treena V. Garrett,
Federal Register Liaison Officer,
U.S. Department of Energy.

Set forth below is the full text of the Secretarial Determination.

**SECRETARIAL DETERMINATION FOR THE SALE, LEASE, OR TRANSFER
OF CERTAIN HIGH-ASSAY LOW ENRICHED URANIUM FOR THE NEXT
TWO YEARS**

I determine that the sale, lease, or transfer of up to 750 kgU of high-assay low enriched uranium (above 5 but less than 20 wt. percent uranium-235) per calendar year to support the development and establishment of molybdenum-99 production capabilities will not have an adverse material impact on the domestic uranium mining, conversion, or enrichment industry. I base my conclusions on the Department's *Analysis of Potential Impacts of Uranium Transfers on the Domestic Uranium Mining, Conversion, and Enrichment Industries*, which is incorporated herein. As explained in that document, I have considered, *inter alia*, the requirements of the *USEC Privatization Act of 1996* (42 U.S.C. 2297h *et seq.*), the nature of uranium markets, and the current status of the domestic uranium industries. I have also taken into account the sales of uranium under the *Russian Highly Enriched Uranium Agreement* and the *Suspension Agreement*.

Date: November 23, 2021

Jennifer Granholm

Secretary of Energy

Set forth below is the full text of the "*Analysis of Potential Impacts of Certain Uranium Transactions on the Domestic Uranium Mining, Conversion, and Enrichment Industries*."

ANALYSIS OF POTENTIAL IMPACTS OF CERTAIN URANIUM TRANSACTIONS ON THE DOMESTIC URANIUM MINING, CONVERSION, AND ENRICHMENT INDUSTRIES

I. Introduction

A. Legal Authority

The Department of Energy (DOE) manages its excess uranium inventory in accordance with the *Atomic Energy Act of 1954* (42 U.S.C. 2011 *et seq.*) (AEA), as amended, and other applicable laws. Specifically, Title I, Chapters 6 and 14 of the AEA authorize DOE to sell or transfer special nuclear material. Low enriched uranium (LEU) is a type of special nuclear material.

The *United States Enrichment Corporation (USEC) Privatization Act* (Pub. L. 104-134, 42 U.S.C. 2297h *et seq.*) places certain limitations on DOE's authority to sell or transfer uranium from its excess uranium inventory. Specifically, under section 3112(d) of the *USEC Privatization Act*, DOE may make certain sales or transfers of natural uranium or LEU if the Secretary determines that the sales or transfers "will not have an adverse material impact on the domestic uranium mining, conversion or enrichment industry, taking into account the sales of uranium under the Russian Highly Enriched Uranium Agreement and the Suspension Agreement." (42 U.S.C. 2297h-10(d)(2)(B)). The validity of any determination under this section is limited to no more than two calendar years subsequent to the determination.¹ The *USEC Privatization Act* also covers sales or transfers of enriched uranium for governmental purposes under section 3112(e), which are not subject to the same limitations of section 3112(d).

B. Transactions considered in this analysis.

Two types of potential transactions are considered in this analysis: (1) the lease of certain high-assay low enriched uranium (HALEU) (LEU enriched above 5 weight (wt.) % U-235, but less than 20 wt. % U-235) for the production of molybdenum-99 (Mo-99); and (2) the sale or transfer of HALEU to producers for use in medical isotope research, development, and production.

The first type of transaction is authorized under the *American Medical Isotopes Production Act* of 2012² (AMIPA). AMIPA directs the Department to establish a Uranium Lease and Take Back (ULTB) program to lease LEU for irradiation to produce Mo-99 in the United States without the use of highly enriched uranium (HEU). The leased material would be used as either driver fuel for reactors employed in medical isotope production, as target material for irradiation and extraction of Mo-99, or both. The exact uses and designs vary by producer, but fission-based production usually involves fabrication of uranium targets for irradiation in a reactor, followed by chemical

¹See section 306(a) of Division D, Title III of the *Consolidated and Further Continuing Appropriations Act, 2015* (Pub. L. 113-235).

² Pub. L. 112-239, Division C, Title XXXI, Subtitle F, 42 U.S.C. 2065.

processing to extract the Mo-99 for packaging into a generator and delivery to a radiopharmacy.

The second type of transaction considered in this analysis is a sale or transfer of HALEU to producers for use in medical isotope research and production processes that are not under the ULTB program and do not meet the criteria of section 3112(e)(3) of the *USEC Privatization Act*. Such uranium sales or transfers would require a Secretarial Determination under section 3112(d)(2)(B) of the *USEC Privatization Act* as well as meeting the other criteria of section 3112(d)(2).

The materials considered in this analysis would be transferred during calendar years 2021 through 2023 and consist of no more than 750 kg of HALEU in any calendar year. Based on semi-annual LEU demand surveys conducted to determine domestic producers' material needs, DOE's National Nuclear Security Administration (DOE/NNSA) increased the amount being assessed in this Determination from 500 kg per calendar year for the last Determination (2019 to 2021), to 750 kg of HALEU per calendar year during this Determination period. Assuming a tails assay of 0.20 wt. % U-235, this quantity would be equivalent to approximately 28,700 kgU of natural uranium hexafluoride and approximately 33,850 separative work units ("SWU") to produce 750 kg of HALEU at 19.75 wt. % U-235.³

II. Analytical Approach

The analytical approach relied on for previous Secretarial Determinations covering the sale, transfer, or lease of excess uranium for Mo-99 research and production (80 F R 65728, Oct. 27, 2015), the ULTB program (81 FR 1409, Jan. 12, 2016), and the Secretarial Determination for the Sale, Lease or Transfer of Uranium (signed and dated November 26, 2019) is repeated here and updated to the extent necessary.

This analysis evaluates the state of the domestic uranium industries and the relevant impacts if DOE goes forward with these potential transactions. DOE has developed a set of factors that this analysis considers in assessing whether DOE's uranium sales and transfers will have an "adverse material impact" on the domestic uranium mining, conversion, or enrichment industry:

1. Prices
2. Production at existing facilities
3. Employment levels in the industry
4. Changes in capital improvement plans and development of future facilities
5. Long-term viability and health of the industry
6. *Russian HEU Agreement* and *Russian Suspension Agreement*

While no single factor is dispositive of the issue, DOE believes that these factors are representative of the types of impacts that the proposed sale, lease, or transfer may have on the domestic uranium industries. Not every factor will necessarily be relevant on a

³ The calculation is based on the Y-12 Standard Specification for LEU Metal Supply for Mo-99 Isotope Production, which assumes deliveries of quantities of 19.75 wt. % LEU. If any sale, lease, or transfer includes material at an assay other than 19.75 wt. %, the amount will be converted so that the total amount in any calendar year is equivalent to no more than 750 kgU at 19.75 wt. %.

given occasion or to a particular industry; DOE intends this list of factors only as a guide to its analysis.

III. Assessment of Potential Impacts

1. Prices

There is currently no commercial supplier for HALEU. Therefore, there is no established market price for HALEU. DOE sets a price for HALEU based on a combination of commercial market price components for LEU, plus a charge for the separative work above the 5% LEU limit reflecting the historical cost to DOE to produce this material.

The market value of 4.95% enriched LEU has risen 64% from its low point in October 2017. Industry analysts forecast a continued increase in the market value of LEU.⁴ The relatively small quantities of HALEU provided by DOE have not impacted the price increases in this market.

Further, with no commercial provider for HALEU, the DOE sales and leases of HALEU would not displace production or affect prices among the commercial domestic uranium mining, conversion, or enrichment industries, and even if it did, the amount would be so small that the effects would be minimal.

2. Production at existing facilities

An analysis of the impact of the proposed sales and leases based on an assessment of production at existing facilities is straightforward. There is currently no commercial supplier of HALEU in the United States. Due to the lack of a sufficient near-term market, owners and operators of enrichment facilities have not developed commercial HALEU enrichment capability to produce uranium enriched to 19.75 wt. % U-235. With the closing of the Paducah Gaseous Diffusion Plant in 2013, the only operational uranium enrichment facility in the United States is the URENCO USA facility operated by Louisiana Energy Services, LLC, in Eunice, New Mexico, which is currently licensed by the Nuclear Regulatory Commission to possess uranium only up to 5.5 wt. % U-235.⁵

Further, it is not feasible for commercial Mo-99 producers to use commercially available assays of LEU (i.e., LEU enriched to 5 wt. % U-235 or less) instead of HALEU. Given the specialized uses, designs, and regulatory requirements of the fuels and targets used for these isotope production purposes, use of commercial-assay LEU would prevent the reactor or target from achieving the same performance or efficiency and thus from being used for their intended purposes.

Although the DOE sales and leases of HALEU would not displace production among the commercial domestic uranium mining, conversion, or enrichment industries, even if it did, the amount would be so small that the effects would be minimal. With respect to these industries, to produce the amount of HALEU in the proposed sales and leases from primary production would require approximately 75,000 pounds of uranium concentrates (U₃O₈), 28,700 kgU of conversion services, and 33,850 SWU of enrichment services. By comparison, the entire domestic fleet of nuclear reactors in 2020 required approximately 43 million pounds of U₃O₈, 16.2 million kgU of conversion services, and

⁴ Energy Resources International, Inc. (ERI), *Nuclear Fuel Cycle Supply and Price Report*, ERI-2006-2101/June 2021.

⁵ U.S. Nuclear Regulatory Commission, *Materials License*. License Number SNM-2010, Amendment 57, Docket Number 70-3103.

about 14.8 million SWU.⁶ Therefore, the feed, conversion, and SWU content of the DOE material represents 0.18%, 0.18%, and 0.23% of annual domestic requirements, respectively.

The domestic conversion industry consists of only one facility that historically produced between 10 million kgU and 12 million kgU per year and reduced its capability to 7 million kgU in 2017. Honeywell, the owner of the sole domestic conversion facility, suspended operation in 2018, but recently announced that the plant would be restarted and projected that production would begin in early 2023.⁷ Thus, although there is currently no conversion occurring in the United States, there are signs of the market improving given this recent announcement.

As mentioned above, there is only one currently operating commercial enrichment facility, URENCO USA's subsidiary, Louisiana Energy Services (LES), LLC in the United States. The total capacity of that facility is 4.9 million SWU.

3. Employment levels in the industry

As stated above, DOE sales and leases of HALEU would not displace production among the commercial domestic uranium mining, conversion, or enrichment industries, and therefore will not affect employment levels in these industries.

4. Changes in capital improvement plans and development of future facilities

Although there is currently no domestic uranium enrichment capability to produce HALEU, there have been recent noteworthy developments. In 2019, the Department entered into a cost-shared contract for a HALEU Demonstration Program with American Centrifuge Operating, LLC (ACO), a subsidiary of the U.S. company, Centrus Energy Corp. ("Centrus"). The Program has objectives to deploy a 16-machine cascade of AC-100 M centrifuges in Piketon, Ohio to produce 19.75 wt. % U-235 with US-origin enrichment technology that will result in a small quantity of HALEU for use in research and development. In June 2021, the Nuclear Regulatory Commission (NRC) approved ACO's license amendment request to produce HALEU with an enrichment assay of up to 20 wt. % U-235 at the Piketon facility.⁸

In another recent development, URENCO USA provided a notice to the NRC in April 2021 of its intent to amend the URENCO USA license to increase the enrichment level up to 10 wt. % U-235. Submittal of the initial license amendment request is expected later in 2021. URENCO USA expects to have capability to deliver HALEU up to 10 wt. % U-235 in 2024. URENCO USA also has longer term plans to produce up to 19.75 wt. % U-235.⁹

⁶ The global requirements information comes from an analysis prepared by Energy Resources International, Inc. (ERI), *Nuclear Fuel Cycle Supply and Price Report*, ERI-2006-2101/June 2021.

⁷ Conversion Services Market update, Energy Resources International, Inc. (ERI), *Nuclear Fuel Cycle Supply and Price Report*, ERI-2006-2101/June 2021.

⁸ American Centrifuge Plant and HALEU, from an analysis prepared by Energy Resources International, Inc. (ERI), *Nuclear Fuel Cycle Supply and Price Report*, ERI-2006-2101/June 2021.

⁹ High-Assay LEU, Urenco, from an analysis prepared by Energy Resources International, Inc. (ERI), *Nuclear Fuel Cycle Supply and Price Report*, ERI-2006-2101/June 2021.

However, the relatively small amounts of material covered by this Determination have no impact on capital improvement plans and development of future facilities including mines, conversion facilities, and enrichment plants.

5. Long-term viability and health of the industry

There is currently no commercial supplier of HALEU in the United States. Therefore, there is no long-term industry impact to assess. As noted above, DOE is working with Centrus to establish a technology base which could provide greater amounts of HALEU if commercialized. Long term impacts of DOE material provided to the market will be assessable when Centrus or another HALEU enricher are closer to entering the nuclear fuel market.

6. Russian HEU Agreement and Russian Suspension Agreement

The *Russian HEU Agreement* ended in December 2013. The *Russian Suspension Agreement* (“Suspension Agreement”) was extended on October 5, 2020 (85 FR 64112) and remains in force through 2040 with annual export limits on Russian enriched uranium product sold to U.S. utilities at commercially available assays (e.g. 5 wt. % U-235) through FY2027 (85 FR 64112).¹⁰ The *Suspension Agreement* allows for the sale of up to the following amounts of U-235 per year in 2021, 2022, and 2023 respectively: 26,254 kg, 21,543 kg, and 25,471 kg. The relatively small amount of material covered by this Determination is minimal compared to domestic needs for LEU and imports from the Russian Federation.

IV. Conclusion

With respect to the six factors listed above to assess market impacts:

1. The relatively small amounts of material covered by this Determination have no impact on the price of HALEU, for which there is currently no commercial market price.
2. There are new developments in the industry, but licensing and production timelines will not be impacted in the timeframe for this Determination.
3. The relatively small amounts of material covered by this Determination have no impact on employment levels in the mining, conversion, or enrichment industries.
4. New market developments will not mature during this Determination period to a point where the market could be impacted by DOE sales or leases.
5. The relatively small amounts of material covered by this Determination have no impact on the long-term viability and health of the mining, conversion, and enrichment industries.

¹⁰ 2020 Amendment to the Agreement Suspending the Antidumping Investigation on Uranium From the Russian Federation, Federal Register / Vol. 85, No. 197 / Friday, October 9, 2020 / Notices <https://www.federalregister.gov/documents/2020/10/09/2020-22431/2020-amendment-to-the-agreement-suspending-the-antidumping-investigation-on-uranium-from-the-russian>.

6. The Russian HEU Agreement and Russian Suspension Agreement are not factors because there is no HALEU currently being imported from Russia to the United States.

Thus, DOE concludes that the sale, lease, or transfer of up to 750 kg of HALEU per calendar year to support the research, development, and production of Mo-99 and other isotopes will not have an adverse material impact on the domestic uranium mining, conversion, or enrichment industry, taking into account the ended *Russian HEU Agreement* and extended *Russian Suspension Agreement*.

[FR Doc. 2022-07667 Filed: 4/8/2022 8:45 am; Publication Date: 4/11/2022]